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Potential for greenhouse gas emission reductions using surplus electricity in hydrogen, methane and methanol production via electrolysis

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Aim of the research

1. To calculate the GHG balance for various PtX options
2. To compare GHG emissions from PtX processes to GHG emissions from alternative production methods
3. To provide recommendations for how PtX processes should be utilized in order to gain the highest GHG emission reductions
4. (To discuss the potential of PtX commodities for replacing conventional fossil fuel-based systems globally)

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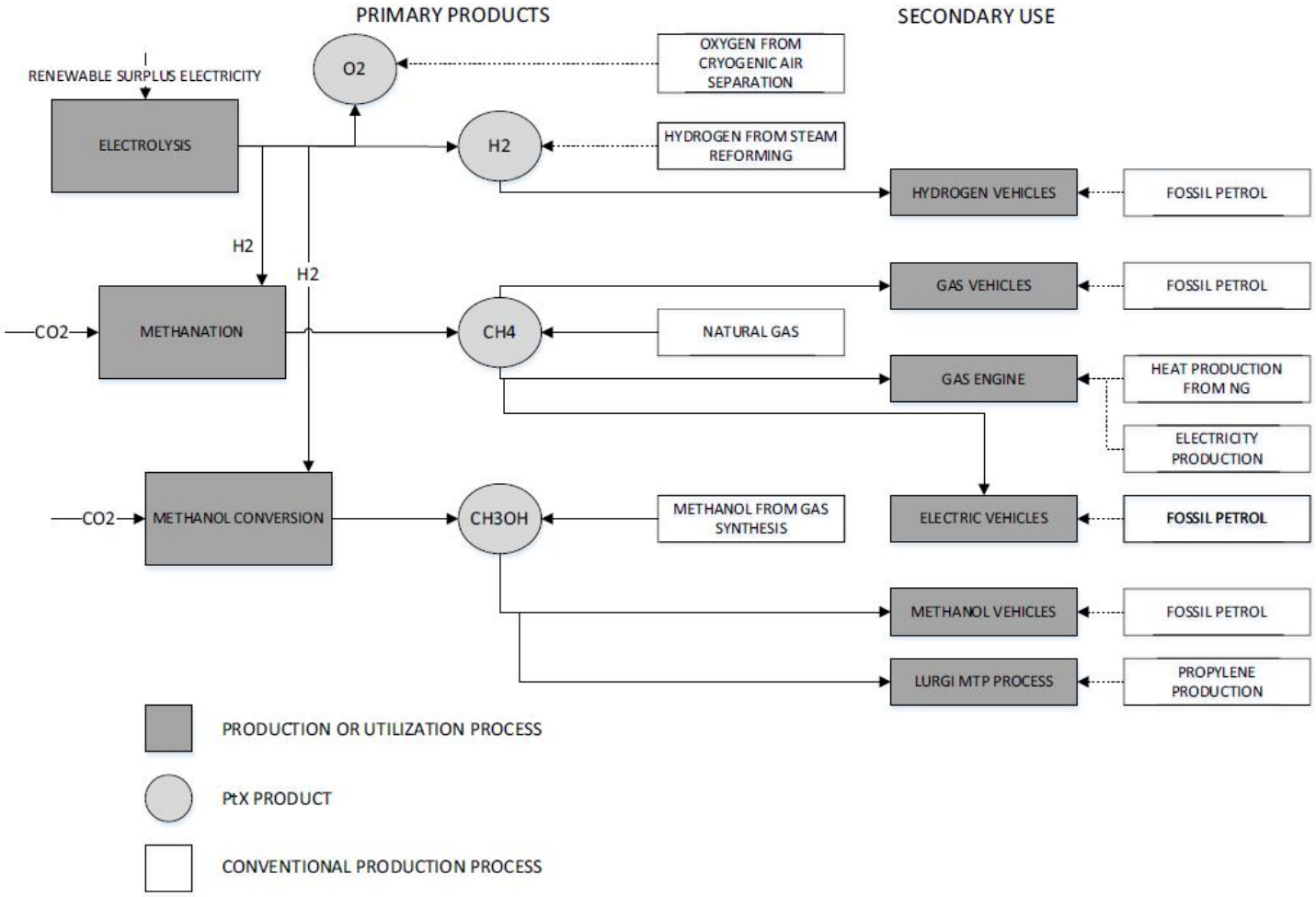
LCA model (simplified)



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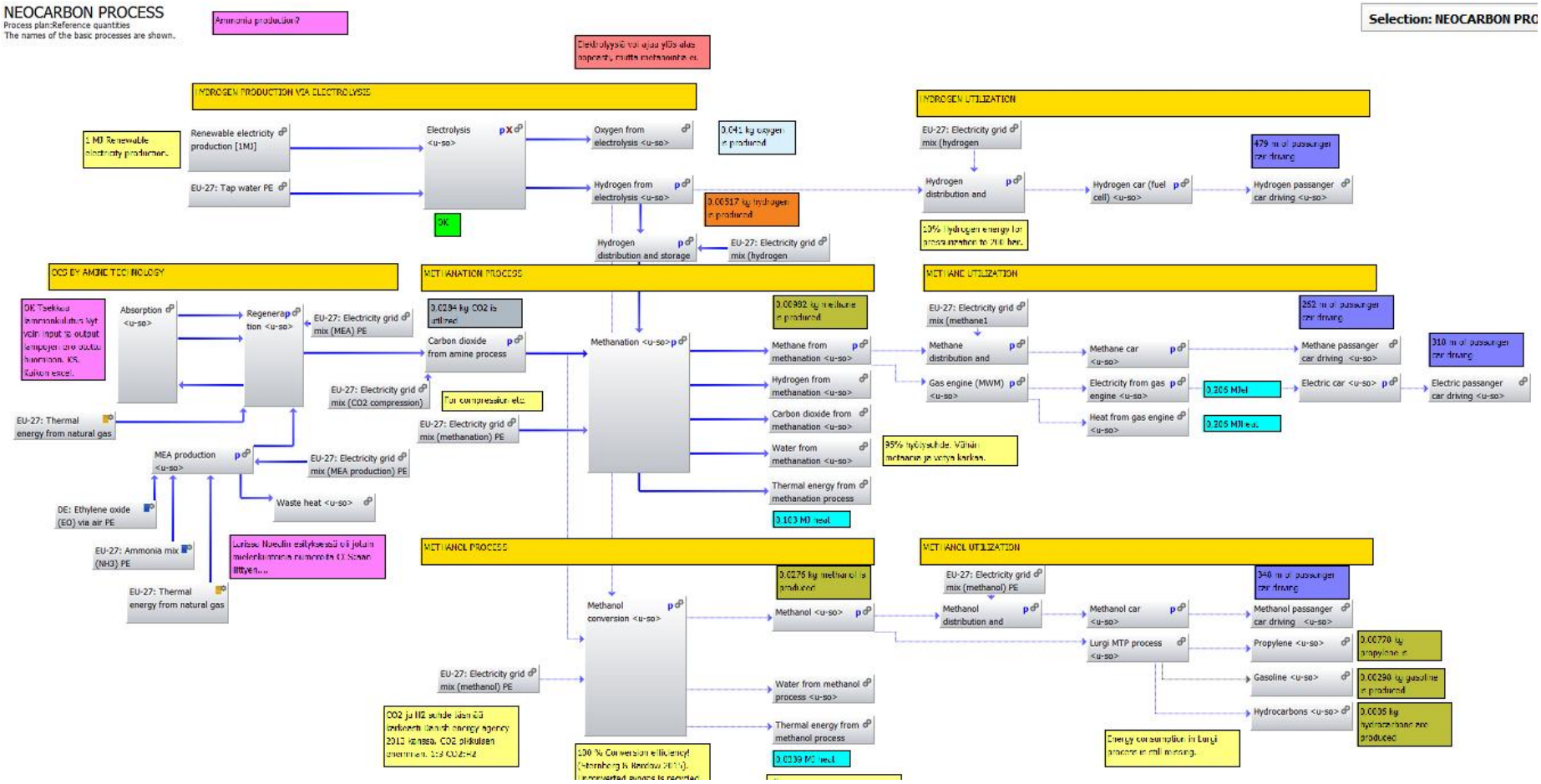
LCA model in GaBi



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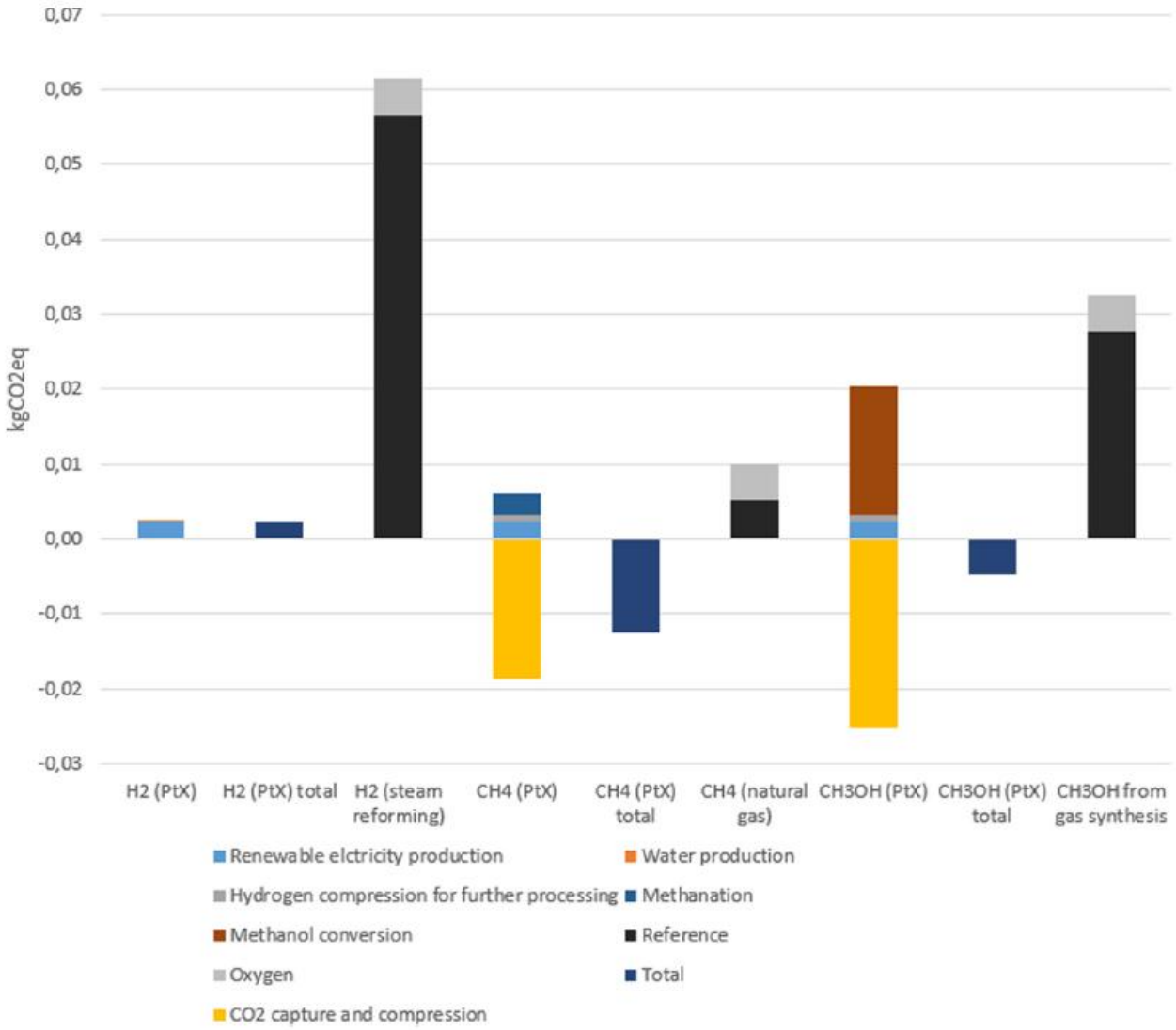
Results: Primary product replacement



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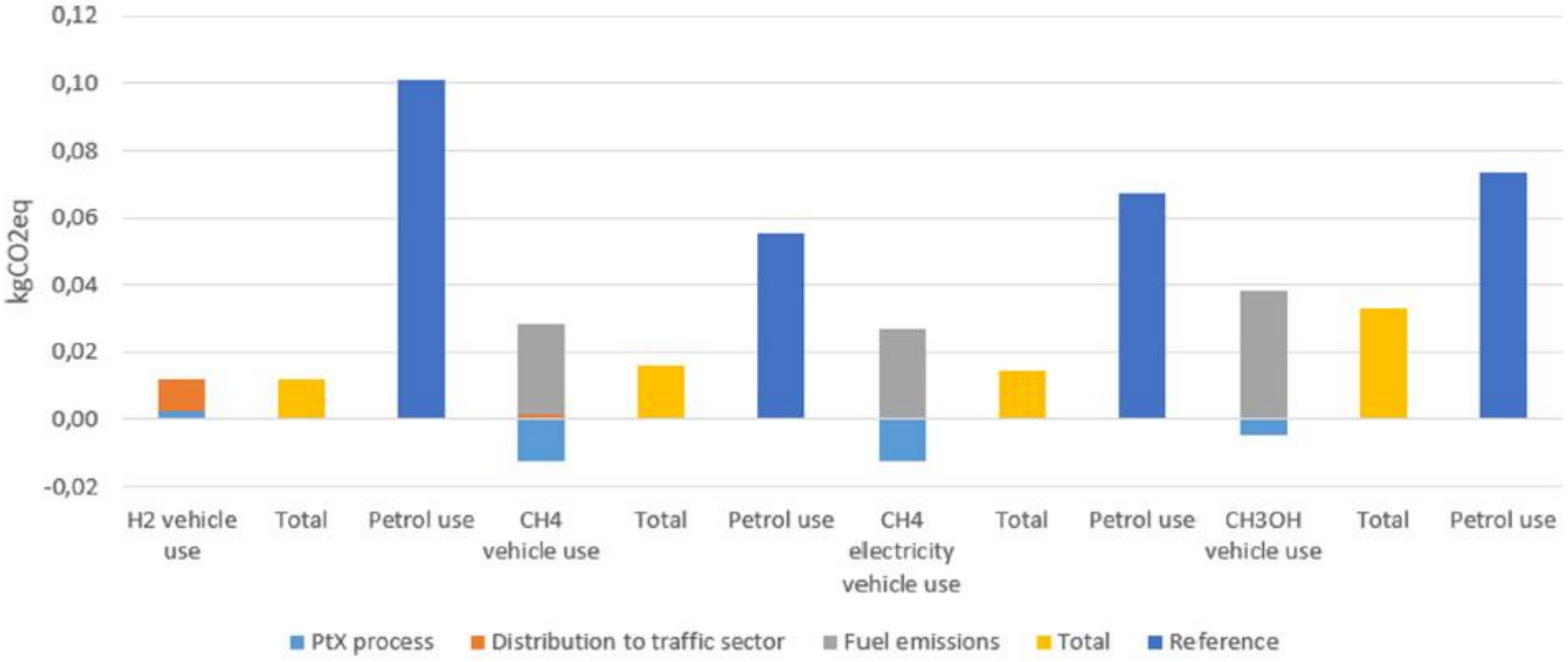
Results: Secondary product replacement



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Sensitivity analysis

- Key factors affecting the results:
  - Electrolysis efficiency
  - Conversion efficiencies and electricity consumptions (methanation and methanol conversion)
  - Vehicle efficiencies

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Conclusions

- All studied PtX routes lead to GHG emission reductions compared to conventional production processes
- Hydrogen use directly leads to highest GHG emission reductions
  - HVO diesel production, Ammonia production etc.
- Also transportation use lead to high GHG emission reductions
  - Requires additional actions
- There is a huge potential for PtX products globally
- Other sustainability aspects were not studied!

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